DOCUMENT RESUME

ED 256 091 EC 172 089

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TITLE Cognitive Training Program for Youths/Young Adults Having a Spinal Cord Injury.
PUB DATE Mar 85
NOTE 18p.; Paper presented at the National Conference on Secondary Transitional and Postsecondary Education for Exceptional Youth (Boston, MA, March 7-9, 1985).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adaptive Behavior (of Disabled); *Cognitive Development; Coping; Emotional Adjustment; Foreign Countries; Learning Problems; *Physical Disabilities; *Problem Solving; Rehabilitation Programs; Young Adults
IDENTIFIERS Ontario

ABSTRACT

The pilot study determined the effectiveness of a cognitive skills training program on both the vocational retraining of five young adults with traumatic spinal cord injuries and learning difficulties and the adaptation process to an altered lifestyle required by permanent paralysis. After a 40-hour Instrumental Enrichment (IE) program, Ss showed significant gains in intellectual, cognitive and problem solving skills. Although behavioral observations indicated psychological and personality changes, these were not evidenced on formal measures. Gains over a wide range of abilities add support to the hypothesis that the IE program was responsible for the improvements in cognitive skills and more effective problem solving skills. Ongoing research is showing that such gains are reliable and are maintained at a 1-year follow-up. (Author/CL)

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ED256091

COGNITIVE TRAINING PROGRAM FOR YOUTHS/YOUNG ADULTS HAVING A SPINAL CORD INJURY

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This pilot study determined the effectiveness of a cognitive skills training program on both the vocational retraining of young adults having a traumatic spinal cord injury and having learning difficulties and the adaptation process to that injury. Five individuals after a forty hour Instrumental Enrichment program showed significant gains in intellectual, cognitive and problem solving skills. Although behavioral observations indicated psychological and personality changes, these were not evidenced on formal measures. Ongoing research is showing that such gains are reliable and are maintained at a one year follow-up.

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Individuals who have become permanently paralysed due to a traumatic spinal cord injury are faced with the necessity of adapting to an altered lifestyle in order to cope with consequences that the disability poses for various aspects of their lives. This adaptation is a learning process that requires not only emotional coping with the losses and necessary changes, but also involves an intellectual and cognitive awareness in order to effectively solve the problems that are a product of their disabilities.

The Departments of Education and Psychology, at Lyndhurst Hospital, have become increasingly concerned about many of the individuals who are seen for ongoing educational or for vocational assessments, who subsequently go on to college or alternate retraining programs and encounter serious difficulties. We feel that, in most instances, these difficulties are not reflecting the lack of intellectual potential but a lack of effective learning skills.

Literature studies show that for persons having a spinal cord injury, the employment rate varies between 20 percent and 46 percent depending on the composition of the samples studied (Chanin and Brown, 1975; Goldberg and Freed, 1982). It is higher for people who have paraplegia than for those who have quadriplegia, and it also tends to be higher for those whose educational experiences are beyond that of high school (Trieschman, 1980).

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In this initial project, our target group was those persons having both a spinal cord injury and learning difficulties. Our hypothesis was that by teaching individuals in this group some basic cognitive skills which contribute to effective learning and problem-solving, two benefits would occur. Firstly, vocational opportunities would be enhanced in that individuals would achieve at a higher level whether this be in a college program, upgrading or on the job training. Secondly, individuals would show a better overall adjustment to their spinal cord injury.

The educational system tends to be product-oriented in its approach, in that students are exposed to facts and information to be remembered, sometimes at the expense of the learning process itself. In a process-oriented approach, students learn how to go about thinking, how to use information and how to be an active rather than a passive learner.

Without such a milieu, the student who has learning difficulties can become discouraged. S/he may or may not be labelled a "slow learner" or "learning disabled" and may or may not receive the necessary remediation. This means that not only do many miss out on educational opportunities, but they also experience negative attitudes toward academic situations, including feelings of failure and lack of self confidence.

This does not mean, however, that individuals who have cognitive deficiencies cannot be vocationally successful. Consider a young man with grade 8 education who has worked as a construction labourer. Any cognitive inefficiencies in this person need not interfere with his lifestyle.

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He can work steadily, have a home and family, and participate in satisfying social and leisure activities. However, after a spinal cord injury, unable to return to his work; and it is now that his cognitive inefficiencies become salient. The processes of re-adaptation and re-learning that are now demanded by his situation (the injury) require a heightened cognitive awareness. In the process of adjustment, the person goes through a re-evaluation which involves an increased intellectual awareness. Through such an awareness, the person develops the ability to identify his problems, to search for alternate solutions (in employment, social life, etc.) to systematically search for employment and retraining and to compare these opportunities, to be realistically aware of his own personal needs and to synthesize and analyse the various components necessary for the integration of his daily functioning.

Instrumental Enrichment Program (I.E.) (Feuerstein, 1980) This program was used to facilitate the acquisition of the above skills. It is based on a model of cognitive development in which cognitive structures are developed through mediated learning experiences, whereby an adult agent/teacher helps select, organize and frame the experiences for the child/student. A critical component in this model is that the basic cognitive functions are modifiable and can be acquired by appropriate mediational learning experiences, even though it is later than in a "normal" developmental sequence.

It is designed to remediate cognitive motivational deficits, thereby enhancing information processing, problem-solving and decision making skills.

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In addition, it endeavours to give reflection and insight into the person's own thought processes and to some of the underlying reasons for success and failure. Several theories on learning disabilities propose that this awareness and insight, or meta cognition, is in fact a major locus of deficit.

Through insight, the student learns the generalization that the strategies and operations have for a variety of learning situations. This is facilitated by the design of each lesson. In the first part, the principles of the exercises and possible strategies to be used are elicited from the students. After a period of independent work, the remaining time is spent on "bridging". In this process, the principles that have been studied are applied to various everyday situations.

Hypotheses The specific hypotheses that were examined through this study are:

1. The intellectual/cognitive functioning of the subjects will be enhanced.
2. The specific problem solving skills of subjects will be enhanced.
3. Several psychological and personality factors will be affected positively by this treatment program.
4. Overall adjustment to the spinal cord injury will be enhanced.
5. Additional positive behavioural and psychological outcomes are expected.

Methodology

Subjects The group comprised of four males and one female who had sustained a paraplegia or quadriplegia as a consequence of a traumatic spinal cord injury. The four males were living in the community while the female was currently in an active rehabilitation program. Education levels ranged from grade 9 to grade 12.

Program The four units of the Instrumental Enrichment Program used were Organization of Dots, Orientation in Space I, Analytic Perception and Comparisons.

Evaluation Measures The cognitive and intellectual measures included the Verbal Scale, Picture Completion and Picture Arrangement sub-tests of the Wechsler Adult Intelligence Scale-Revised Edition (Wechsler, 1981), Raven's Progressive Matrices (Raven's, 1962), the Analysis-Synthesis, Concept Formation and Analogies sub-tests of the Woodcock-Johnson Psycho-Educational Battery (Woodcock and Johnson, 1977), Representational Stencil Design Test (Feuerstein, 1979, based on Arthur, 1930).

Psychological abilities measures included the Social Reaction Inventory (Rotter, 1966), the Multidimensional Health Locus of Control Scale (Wallston, Wallston and DeVellis, 1978), Tennessee Self-Concepts Scale (Fitts, 1965), Goal Attainment Inventory Measure (Stirling, 1980) was used to measure overall satisfaction as an index of adjustment.

A twenty-nine item behavioural observation rating form was completed by instructors, assistants and students.

Procedure

The Instrumental Enrichment program was taught by a special education teacher and a psychologist for three seventy-five minute sessions a week for a total of thirty-one sessions. Pre- and post-assessments on the evaluation measures were given.

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In each session there were four or five assistants who were hospital volunteers. They were present to assist with any difficulties that subjects might encounter with writing and handling of materials.

Results

The performance of each of the subjects on the Wechsler Adult Intelligence Scale in pre- and post-testing is shown in Figure 1 as changes in I.Q. scores.

Insert Figure 1 here

The mean increase of 5.6 I.Q. points from a pre-test mean of 95.4 to a post-test mean of 101.0 exceeds the Standard Error of the mean of 3.2 I.Q. points and represents a significant difference ($p < .05$).

The results from the Raven's are shown in Figure 2.

Insert Figure 2 here

The increase of mean performance of 4.4 was highly significant ($p < .01$), indicating that the group performed much better after the program on a task requiring non-verbal inductive reasoning abilities.

The results from the Woodcock-Johnson Battery are shown in Figure 3.

Insert Figure 3 here

Again, significant changes were found ($p < .05$). This indicated improved performance in non-verbal abstract reasoning, rule learning, conceptualization and expression.

The mean number of correct items solved on the Representational Stencil Design Test is presented in Figure 4.

Insert Figure 4 here

This mean almost doubled at the post test ($p < .01$). There was also significant increases in the mean number of correct stencils used, the correct number of top and bottom strategies and the amount of time taken to complete the test.

No pre- post differences were obtained on any of the non-cognitive ability measures.

In rating themselves on various behaviours, students reported at least some improvement in most areas. Table 1 shows those behaviours on which at least two subjects rated themselves as "Much Improved".

Insert Table 1 here

Staff ratings are summarized in Table 2.

Insert Table 2 here)

A comparison of the two tables shows that ten behaviours are common.

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Based on the data, the findings for the original hypotheses can be summarized:

1. Hypothesis 1 is accepted due to the cognitive gains shown on all measures of intellectual performance.
2. Hypothesis 2 is accepted due to the increase in problem solving skills as measured on the Representational Stencil Design Test.
3. Hypothesis 3 is rejected due to lack of change on the psychological and personality variables. However, psychological factors may tend to take longer to become internalized.
4. Hypothesis 4 is partially accepted. Although there was no increase in overall satisfaction, there were significant increases in present level of functioning and satisfaction with that level of functioning in the various goal areas.
5. Hypothesis 5 is accepted because of the positive changes in behaviour and psychological outcomes that were observed by the staff and the similarity of ratings of improvements given by staff and students.

Conclusion

An examination of the results on the measures of intellectual and cognitive functioning shows that significant gains occurred on almost all of these measures. These gains over such a wide range of abilities add support to the hypotheses that the I.E. Program was responsible for the improvements both in cognitive skills and in the development of more effective problem-solving skills.

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An examination of the sub-scales of the Wechsler Scale adds support to the hypotheses that the program led to an increase in cognitive skills and a greater ability to apply acquired knowledge to new problem solving situations. For example, no changes occurred on the Information sub-test whereas there was increase on the Comprehension sub-test. The gains found on the other measures of cognitive functioning imply that the students were more attentive to detail, improved in abstract reasoning and were able to apply more effective problem solving strategies. In addition, they showed a greater flexibility in cognitive strategies, an improved ability to analyse material into component parts and mentally reconstruct them into logical sequences, as well as increased capacity to benefit from instruction and feedback.

This has been one of the few studies using the I.E. Program with a population other than children. These results suggest that there is potential for cognitive modifiability in adult populations having reasonably adequate levels of functioning but who have some deficits in various cognitive areas.

Characteristics of any program which are important for demonstrating effectiveness are those of reliability, generalizability and durability of gains. Ongoing research with a second group has demonstrated equivalent cognitive gains. One component of generalizability is that of non-specific transfer, which refers to performance on non-trained items and concepts. It is felt that the evaluation measures provided a range of situations that in fact demanded the application of problem solving skills to new situations. Ongoing research is addressing the issue of durability and to date, has shown that cognitive gains are maintained after one year by this initial group.

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TABLE 1

BEHAVIOURS RATED 'MUCH IMPROVED' BY TWO OR MORE SUBJECTS

Read and use directions spontaneously
Decrease in requests for repeated basic instruction and/or explanation
Willingness to defend own opinions on basis of logical evidence
Increased willingness to participate in oral discussion
Increased tolerance for opinion of others and increased listening to others
Lengthened attention span and time on task
Increased readiness to cope with more difficult problems
Increased completeness of answers
Spontaneous use of acquired functions and operations in other areas
Increased self-pride and enthusiasm for learning
Lessened anxiety about approaching something new
Increased accuracy of observation and/or inclusion of more relevant detail
Development of problem-solving strategies
Increased search for alternative answers
Decreased fear of failure

TABLE 2

STAFF RATINGS - BEHAVIOURS WITH MEAN LESS THAN 1.8 FOR THREE OR MORE SUBJECTS.

Read and use directions spontaneously
Spontaneous correction of own mistakes
Decrease number of erasures and errors
Increase in students demand for precision
Automatically checking own work
Increased willingness to participate in oral discussion
Increased readiness to cope with more difficult problems
Increased relevance of answers
Increased completeness of answers
Increased self-pride and enthusiasm for learning
Increased feelings of success and improved self-image
Lessened anxiety about approaching something new
Increased accuracy of observation and/or inclusion of more relevant detail
Development of problem-solving strategies
Increased search for alternative answers
Decreased fear of failure.

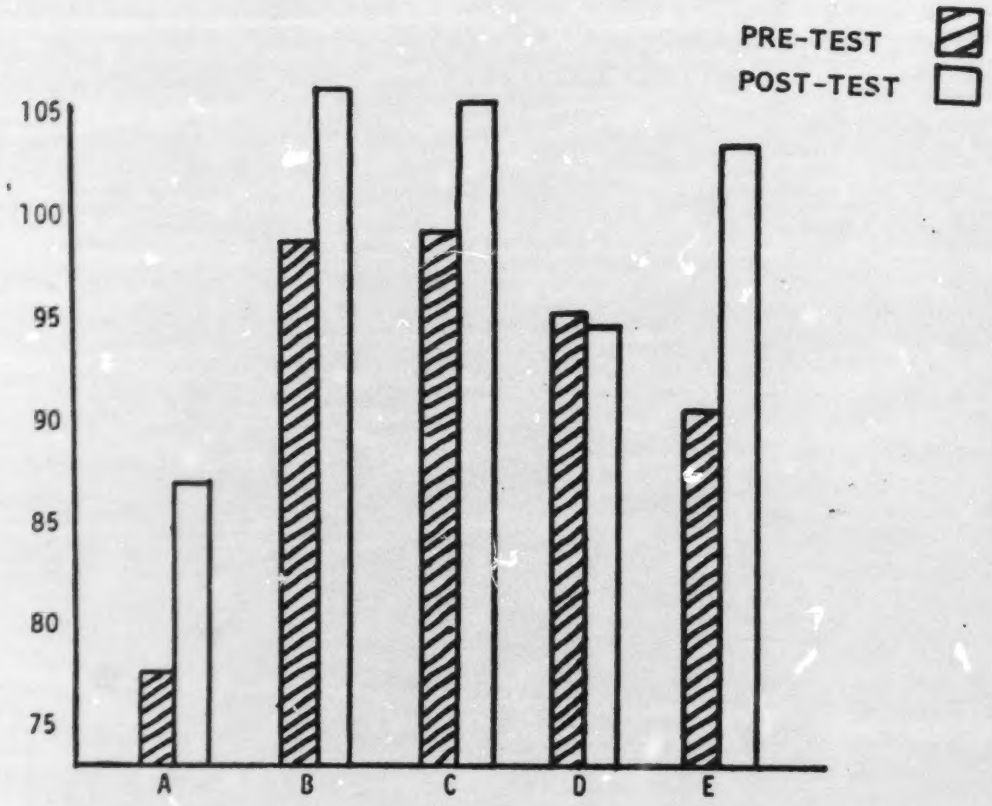

Figure 1. Verbal Scale I.Q. on WAIS-R for each subject.

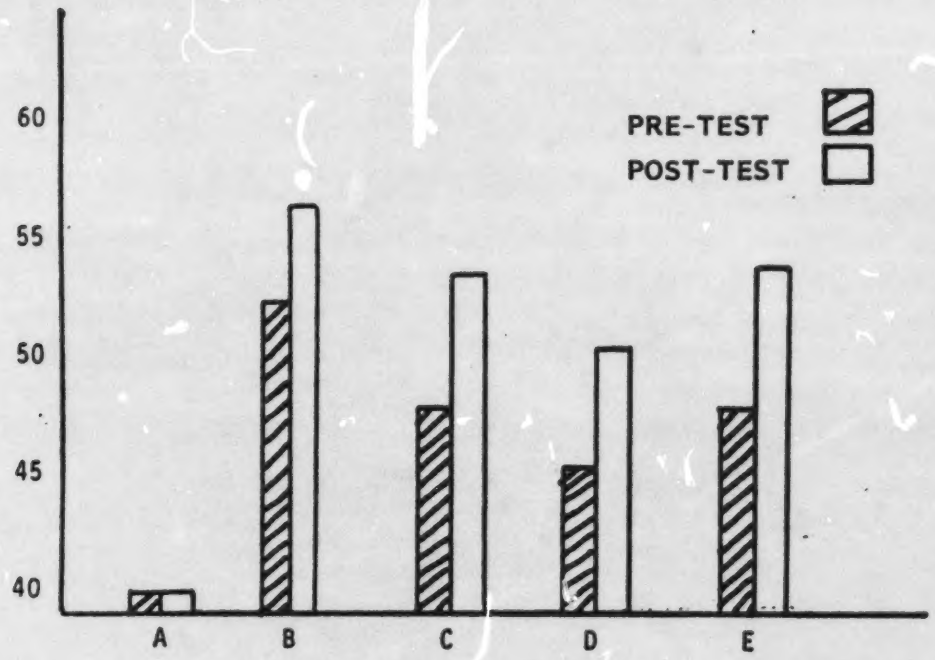

Figure 2. Scores on Ravens Matrices for each subject

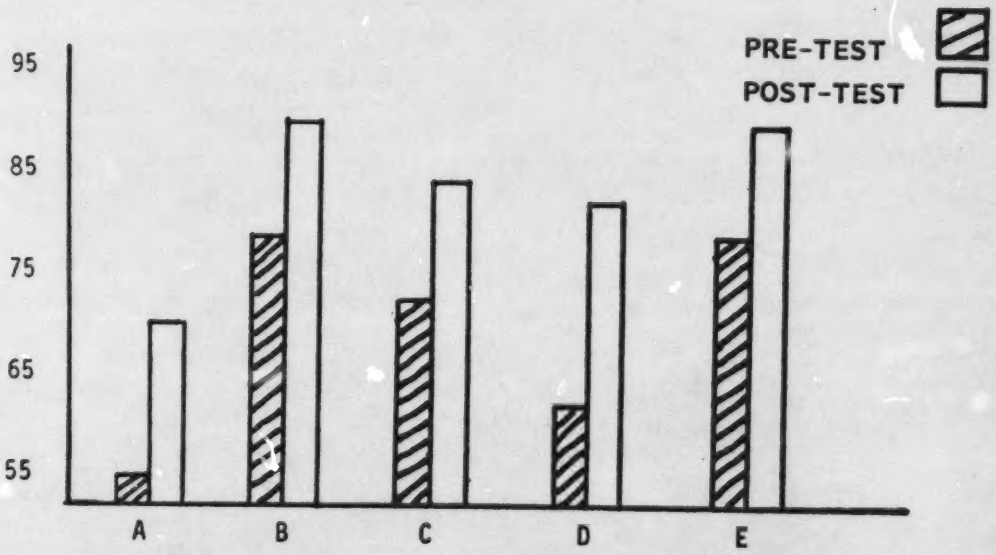

Figure 3. Scores on Woodcock Johnson Reasoning tests for each subject

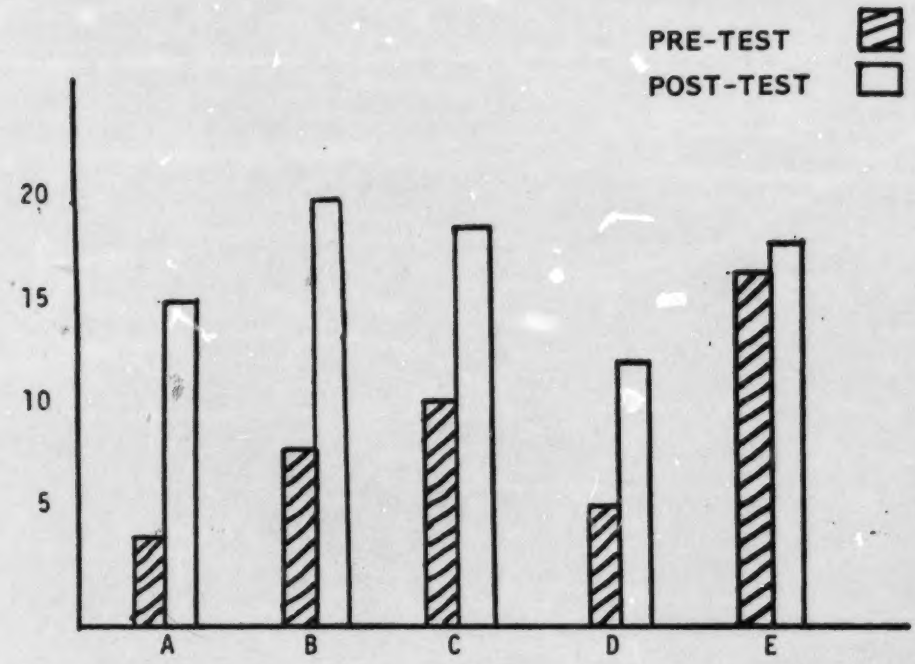

Figure 4. Scores on Representational Stencil Design Test for each subject